NUTRITIONAL STATUS OF VITAMIN B12 AND VITAMIN D SHOWN TO BE IMPORTANT INDICATORS OF CANCER RISK

James Meschino DC, MS, ND

A recent article by Drs. A.S. Plant and G. Tisman, published in *Nutrition and Cancer* (Volume 56, Number 2, 2006) highlighted the emerging evidence that links sub-optimal nutritional status of vitamin B12 and vitamin D with increased risk of cancer. (1) Previous studies have shown that low serum levels of vitamin D (25-hydroxyvitamin D) are associated with a higher frequency of at least 17 different malignancies, including breast, colon, prostate, ovarian, and other cancers. (2-7) Vitamin B12 deficiency has been associated with an increased risk of breast cancer. (8,9) In one study of postmenopausal women low levels of vitamin B12 were associated with 2.5 - 4.0 increased risk of breast cancer (10).

The anticancer properties of vitamin D are reported to stem from its ability to bind to vitamin D receptors on the surface of cells (many tissues contain vitamin D receptors) and thereby, decrease the rate of cellular proliferation (cellular replication) and encourage cellular differentiation (maturation). Both of these influences reduce the risk that a cell will become malignant. Vitamin D has also been shown to exert antineoplastic influences on existing cancer cells, which maintain vitamin D receptors. Under experimental conditions vitamin D has been able to slow the growth of cancer cells and encourage cellular differentiation (more mature looking cells with less malignant properties). Several recent clinical trials have shown that high dose vitamin D supplementation can slow the rise in PSA in prostate cancer patients and improve median survival, when added to conventional therapies. Vitamin D also binds to receptors on immune cells, acting as an immune modulator. (11-15)

The anticancer properties of vitamin B12 are considered to be related to its involvement in cycling homocysteine to methionine. Methionine is then converted into S-adenosyl methionine (SAMe), which provides a methyl group to form the methylated nucleotides required for DNA synthesis. As cells replace themselves from one generation to the next, sufficient vitamin B12 and folic acid are required to enable the emerging cell to make sufficient and well formed DNA. Even a marginal deficiency in vitamin B12 and/or folic acid can lead to hypomethylation of DNA. DNA hypomethylation makes the chromosomal linkages weaker and more susceptible to forming mutations linked to cancer. Many cancers have been linked to DNA hypomethlyation of oncogenes suppressor genes, which has been shown to be prevalent in patients with low levels of vitamin B12. Recent evidence suggests that this appears to be especially critical in the prevention of breast cancer. (8,9,10,16,17)

The Aging Process Increases Demand For Higher Intake Levels Of Vitamin B12 and Vitamin D

The incidence of many cancers increases with advancing age. Although there are numerous reasons to explain this finding, one factor may be related to the fact that nutritional status of vitamin B12 and vitamin D tend to be reduced as we age, due to predictable age-related changes in the body's physiology. In the case of vitamin B12, thirty to forty percent of elderly people suffer from gastritis, an inability to secrete adequate stomach acid, which impairs absorption of vitamin B12. Stomach acid secretions include intrinsic factor, which binds with vitamin B12 to facilitate its absorption into the bloodstream upon reaching the ileum of the small intestine. As such, the age-related decrease in stomach acid secretion results in reduced absorption of vitamin B12 as we age. (18)

In regards to vitamin D, as we age our skin shows a reduced ability to synthesize vitamin D upon exposure to sunlight (ultra-violet radiation) and the kidney shows a reduce ability to convert 25-hydroxy vitamin D into 1,25-dihydroxy vitamin D (calcitriol), which is the most potent form of vitamin D. As a result, our vitamin D status tends to decrease with age. (19) Studies demonstrate that the frequency of serum vitamin D insufficiency (25-hydroxy vitamin D) is highest among the elderly. As much as 50% of the elderly population in North America may have blood levels of 25-

hydroxy vitamin D below 75 nmol/L. This not only increases risk of osteoporosis and related fractures, but may also increase risk of certain cancers. (20)

Findings From The Plant and Tisman Study Of Cancer Patients

In a study of 70 cancer patients who were under the care of Dr. G. Tisman, blood results showed that 72% of these cancer patients had blood levels of 25-hydroxy vitamin D below 75 nmol/L and 34% had blood levels of holotranscobalamin (HTCII) below 69 pg/ml. Holotranscobalamin is the metabolically active form of vitamin B12. This is an important point, as only 6% of this patient group showed low levels of serum vitamin B12 (normal = > 300 pg/ml). Thus, serum levels of holotranscobalamin are considered a more accurate indicator of vitamin B12 status and cancer risk. The results of this study indicate that many cancer patients have low blood levels of vitamin D and/or vitamin B12 (HTCII), which may have made these individuals more susceptible to cancer development. (1)

Previous studies have shown that individuals with low serum levels of vitamin D (below 75 nmol/L) and/or hypomethylation of DNA, secondary to compromised nutritional status of folic acid and/or vitamin B12, are more susceptible to subsequent development of certain cancers. (21 – 26) The findings of Plant and Tisman serve to support the correlation between sub-optimal nutritional status of vitamin D, vitamin B12 and increased cancer risk.

Butterworth et al, found the cervical dysplasia risk from human papillomavirus (HPV) to be limited to those with low folic acid status. Reversal of cervical dysplasia and bronchial dysplasia (two pre-cancerous states) has been attained through the administration of folic acid and vitamin B12 supplementation. (27)

Based on the available evidence it is advisable to include fasting vitamin D, holotranscobalamin and serum folic acid levels among the battery of blood tests performed to help determine a patient's health status and risk of future illness. Many health experts suggest that vitamin D levels (25- hydroxyl vitamin D) should be in the range of 80 – 130 nmol/L and transcobalamin levels should be in the range of 70 - 130 pg/ml. Vitamin B12 levels should exceed 300 pg/ml. (1) To maintain these values throughout adult life it may be wise for individuals to supplement each day with 400 – 1,000 IU of vitamin D (depending on their initial fasting levels) and a B-50 complex (containing 50 mcg of vitamin B12 and 400 mcg of folic acid). Studies suggest that a folic acid fasting blood level of less than 4 ng/mL is the level at which chromosomal breaks occur more frequently upon which cancer risk increases dramatically. Currently, 15% of the U.S. population have folic acid levels below 4 ng/mL. (28) Low intake levels and serum levels of folic acid appear to especially increase risk of colon cancer, according to the investigations undertaken to date. Some studies suggest that an intake of folic acid above 400 mcg per day may reduce risk of colon cancer by 31% (25,26,28)

Dr. Tisman recommends supplementing cancer patients with 500-1,000 mcg of vitamin B12 (orally), especially if they are undergoing chemotherapy and 1,000 – 4,000 IU of vitamin D (orally). Monitoring of blood levels is necessary in these cases to ensure that HCTII blood levels are maintained between 70 – 130 pg/ml and that 25-hydroxy vitamin D levels do not exceed 200 nmol/L. Previous studies have shown that co-administration of vitamin B12 and folic acid with certain chemotherapy drugs (e.g. Alimta) reduced mucositis and diarrhea, which normally occur with these drugs. Vitamin B12 and folic acid play an important role in supporting the integrity of the intestinal lining and higher doses of these nutrients are required when the body is under attack from chemotherapy agents, which can damage these tissues. (1)

For more information on this or other related topics, visit Dr. Meschino's website at: http://www.renaisante.com/

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